

I CLAIM:

1. A fuel cell system, comprising:

a source of hydrogen gas;

a fuel cell stack including at least one fuel cell adapted to receive a flow containing hydrogen gas from the source and to produce an electric current therefrom;

a purge assembly including at least one purge valve adapted to selectively purge the fuel cell stack to reduce the concentration of a selected composition therein;

a sensor assembly including at least one sensor adapted to measure a value of a process parameter representative of the performance of the fuel cell stack; and

a controller adapted to actuate the purge assembly if the value of the process parameter exceeds a determined value.

2. The system of claim 1, wherein the selected composition is water.

3. The system of claim 1, wherein the selected composition is nitrogen.

4. The system of claim 1, wherein the selected composition is methane.

5. The system of claim 1, wherein the process parameter includes a variable adapted to change proportional to the performance of the fuel cell stack.

6. The system of claim 5, wherein the process parameter includes a variable adapted to change directly proportional to the performance of the fuel cell stack.

7. The system of claim 1, wherein the process parameter includes a variable adapted to change proportional to the current being produced by the fuel cell stack.

8. The system of claim 1, wherein the process parameter includes the power produced by the fuel cell stack.

9. The system of claim 1, wherein the process parameter includes the rate at which water is generated in the fuel cell stack.

10. The system of claim 1, wherein the value of the process parameter is a cumulative value of the process parameter during an operative cycle of the fuel cell stack.

11. The system of claim 1, wherein the process parameter includes the current produced by the fuel cell stack during an operative cycle.

12. The system of claim 1, wherein the process parameter includes the power produced by the fuel cell stack during an operative cycle.

13. The system of claim 1, wherein the value of the process parameter is a cumulative value of the process parameter during an operating cycle of the fuel cell stack.

14. The system of claim 1, wherein the controller includes a memory device in which the determined value is stored.

15. The system of claim 1, wherein the controller includes at least one analog circuit adapted to compare the value of the process parameter to the determined value and actuate the purge assembly if the value of the process parameter exceeds the determined value.

16. The system of claim 1, wherein the controller includes software executing on a processor.

17. The system of claim 1, wherein the controller includes at least one digital circuit adapted to compare the value of the process parameter to the determined value and actuate the purge assembly if the value of the process parameter exceeds the determined value.

18. The system of claim 1, wherein upon actuation of the purge assembly, the controller is adapted to reset the value of the process parameter.

19. The system of claim 1, wherein the controller further includes a user interface adapted to receive user inputs and communicate the user inputs to the controller.

20. The system of claim 19, wherein the user interface is adapted to receive a user input selecting the process parameter to be measured by the sensor assembly.

21. The system of claim 19, wherein the user interface is adapted to receive a user input selecting the determined value.

22. The system of claim 19, wherein the user interface is adapted to receive a user input to automatically actuate the purge assembly.

23. The system of claim 19, wherein the user interface further includes a display region adapted to present information to a user.

24. The system of claim 23, wherein the display region is adapted to display information regarding the operation and performance of the fuel cell system.

25. The system of claim 1, wherein the system further includes at least one device adapted to apply an electrical load to the fuel cell stack.

26. The system of claim 1, wherein the fuel cell stack includes at least one proton exchange fuel cell.

27. The system of claim 1, wherein the fuel cell stack includes at least one alkaline fuel cell.

28. The system of claim 1, wherein the source includes a storage device containing hydrogen gas.

29. The system of claim 28, wherein the storage device includes a storage tank.

30. The system of claim 28, wherein the storage device includes a hydride bed.

31. The system of claim 1, wherein the source includes a fuel processor adapted to produce the flow containing hydrogen gas.

32. The system of claim 31, wherein the fuel processor is adapted to produce the flow by steam reforming a carbon-containing feedstock and water.

33. The system of claim 31, wherein the fuel processor is adapted to produce the flow by partial oxidation of a carbon-containing feedstock.

34. The system of claim 31, wherein the fuel processor is adapted to produce the flow by pyrolysis of a carbon-containing feedstock.

35. A fuel cell system, comprising:

a source of hydrogen gas;

a fuel cell stack adapted to receive a stream containing hydrogen gas from the source, wherein the fuel cell stack includes at least one fuel comprising an anode chamber and a cathode chamber separated by an electrolytic membrane, wherein the anode chamber is adapted to receive at least a portion of the stream containing hydrogen gas and the cathode chamber is adapted to receive a stream containing oxygen gas;

a purge assembly adapted to selectively purge the fuel cell stack; and

means for measuring a value of a process parameter representative of the performance of the fuel cell stack and actuating the purge assembly if the value exceeds a determined value.

36. The system of claim 35, wherein the source includes a storage device containing hydrogen gas.

37. The system of claim 36, wherein the storage device includes a storage tank.

38. The system of claim 36, wherein the storage device includes a hydride bed.

39. The system of claim 35, wherein the source includes a fuel processor adapted to produce the flow containing hydrogen gas.

40. The system of claim 39, wherein the fuel processor is adapted to produce the flow by steam reforming a carbon-containing feedstock and water.

41. The system of claim 39, wherein the fuel processor is adapted to produce the flow by partial oxidation of a carbon-containing feedstock.

42. The system of claim 39, wherein the fuel processor is adapted to produce the flow by pyrolysis of a carbon-containing feedstock.

43. The system of claim 35, wherein the system further includes at least one device adapted to receive at least a portion of an electric current produced by the fuel cell stack.